Check List 8(4): 675–692, 2012
© 2012 Check List and Authors
ISSN 1809-127X (available at *www.checklist.org.br*)

Check List
Journal of species lists and distribution

LISTS OF SPECIES

Mammals of Serra da Bocaina National Park, state of Rio de Janeiro, southeastern Brazil

Ana Cláudia Delciellos [1*], Roberto Leonan Morim Novaes [2], Mariana Fiuza de Castro Loguercio [3], Lena Geise [4], Ricardo Tadeu Santori [5], Renan de França Souza [2], Bernardo Silveira Papi [1], Daniel Raíces [6], Nadjha Rezende Vieira [1], Saulo Felix [2], Nathalia Detogne [6], Cleber Christianes Souza da Silva [3], Helena de Godoy Bergallo [6] and Oscar Rocha-Barbosa [3]

1 Universidade Federal do Rio de Janeiro, Departamento de Ecologia, Laboratório de Vertebrados, CP 68020, Ilha do Fundão. CEP 21941-902. Rio de Janeiro, RJ, Brazil.
2 Universidade Federal do Estado do Rio de Janeiro, Departamento de Zoologia, Laboratório de Mastozoologia, Av. Pasteur, 458, Urca. CEP 22290-240. Rio de Janeiro, RJ, Brazil.
3 Universidade do Estado do Rio de Janeiro, Departamento de Zoologia, Laboratório de Zoologia de Vertebrados - Tetrapoda, Rua São Francisco Xavier, 524, Maracanã. CEP 20550-013. Rio de Janeiro, RJ, Brazil.
4 Universidade do Estado do Rio de Janeiro, Departamento de Zoologia, Laboratório de Mastozoologia, Rua São Francisco Xavier, 524, Maracanã. CEP 20550-900. Rio de Janeiro, RJ, Brazil.
5 Universidade do Estado do Rio de Janeiro, Departamento de Ciências, Faculdade de Formação de Professores, Rua Dr. Francisco Portela, 1470, Patronato. CEP 24435-000. São Gonçalo, RJ, Brazil.
6 Universidade do Estado do Rio de Janeiro, Departamento de Ecologia, Laboratório de Ecologia de Mamíferos, Rua São Francisco Xavier, 524, Maracanã. CEP 20559-900. Rio de Janeiro, RJ, Brazil.
* Corresponding author. E-mail: *anadelciellos@yahoo.com.br*

ABSTRACT: Here we present a commented list of mammals registered in the Serra da Bocaina National Park. Three field trips (February, 2010, and May and July, 2011) were accomplished along the RJ-165 highway in the Municipality of Paraty, State of Rio de Janeiro, Brazil. Forty-eight species belonging to nine orders were recorded. The local mammal fauna could be considered diverse and rich, with some species regarded as biological indicators of habitat quality. Endangered and rare rodent species like *Blarinomys breviceps*, *Juliomys rimofrons*, and *Thaptomys nigrita* were captured. Road and hunting impacts on mammals are discussed.

INTRODUCTION

The Brazilian Atlantic Forest is a biome of great importance in terms of conservation due to the high biodiversity and endemism of species (Myers *et al.* 2000). Originally, it occupied about 12% of all Brazilian territory, but historically it has been largely devastated for the production of sugar cane, coffee, and cocoa (Drummond 1997). At present, the main causes of its devastation are land expansion for agriculture and cattle raising, followed by the growth of urban centres (Fiszon *et al.* 2003). Atlantic Forest cover is currently estimated between 11.4 and 16% of its original extent, with 32 to 40% of this coverage represented by areas of secondary forest and fragments smaller than 100 ha (Ribeiro *et al.* 2009).

The Serra da Bocaina National Park (SBNP), established by the Federal Decree 68,172 of 4 March 1971, is one of the largest protected areas of Brazilian Atlantic Forest, with a total area of 104,000 ha (IBAMA 2001). It is connected to other adjacent protected areas, such as Serra do Mar State Park, the Tamoios Ecological Station, the Bay of Paraty, the Paraty-Mirim and the Saco do Mamanguá Environmental Protection Areas, the Juatinga Ecological Reserve and the Cairuçu Environmental Protection Area. These protected areas together form the Bocaina Mosaic, that was established by Decree 349 of 11 December 2006, as part of the Biodiversity Corridor of the Serra do Mar (Lino and Albuquerque 2007; Mosaico Bocaina 2010). The SBNP has a great altitudinal variation which, combined with different types of topography and soils among other characteristics, resulted in a great diversity of vegetation types included into the Atlantic Forest biome (IBAMA 2001).

According to previous lists for Atlantic Forest mammals, about 150 species may occur in the area of SBNP (IBAMA 2001; Reis *et al.* 2007, 2010, 2011; Bonvicino *et al.* 2008; B.F. Leopoldo, unpublished data). Despite the 40 years after the creation of SBNP, a more comprehensive mammalogical survey has not been carried out yet, and a more complete list of species is still lacking. There are no previous studies on bats in the region. Few studies about parasites revealed the occurrence of some species of non-volant small mammals (Moraes *et al.* 2003; Silva *et al.* 2007). Medium and large sized mammals were surveyed in SBNP in a single study that recorded 25 species (B.F. Leopoldo, unpublished data), from which 36% are considered endangered in the Brazilian red list (see Machado *et al.* 2008).

In this study we surveyed mammal species in the SBNP at three sites along the state highway RJ-165 in the Municipality of Paraty, state of Rio de Janeiro, southeastern Brazil. For each species comments about methods of capture, habitat characteristics, geographic distribution and conservation status were included.

MATERIALS AND METHODS

Study area

Serra da Bocaina National Park is located in the states of Rio de Janeiro (61.9%) and São Paulo (38.1%), between 22°40'–23°20' S and 44°24'–44°54' W, Brazil (IBAMA

2001; Figure 1). The climate in the region is characterized as super-humid temperate and altitude ranges from sea level to 2,088 m (IBAMA 2001). Vegetation varied from dense evergreen forest to high-altitude fields (C*ampos de Altitude*), inserted in the Atlantic Forest biome (IBAMA 2001). The state highway RJ-165 crosses the park, connecting the Municipalities of Cunha, state of São Paulo, and Paraty, state of Rio de Janeiro. The three sampling sites were located along this highway in the Municipality of Paraty, encompassing different altitudinal levels. Only dense evergreen forest areas were sampled.

Survey of non-volant small mammals

Small mammals belonging to the orders Rodentia and Didelphimorphia were sampled at three sites distributed along the RJ-165 highway in different sampling periods, with live traps and pitfall traps (IBAMA/MMA, process no. 02001.003937/2008-18, authorization no. 93/2011; permission for capture, handling and collection of voucher specimens of small-mammals and bats).

At each sampling site, two 290 m transects (A and B) were established (Table 1), each with 30 trap stations 10 m apart from each other. Each station had one live trap, either a Tomahawk® (26x9x9 cm) placed on the floor, or a Sherman® (23x8x9 cm) in the understory between 1.5 and 2.5 m above ground, to sample species with terrestrial and arboreal habits, respectively. Live-trap type was alternated at each station. Live traps remained active for three to five consecutive nights in May 2011, and were checked in the morning for removal of the captured specimens and/or replacement of the bait, which was composed of a mixture of bacon, banana, grinded peanut and oat in order to attract animals with different food habits, as frugivores, granivores, carnivores, and omnivores.

Pitfall-trap sets consisted of five 60 litre plastic buckets in a single transect, 10 m apart. The buckets were connected by a plastic-sheet drift fence 0.5 m high, buried 0.1 m below and extended perpendicularly to the ground, in order to induce the capture of wandering individuals (Voss and Emmons 1996). All the pitfall traps were checked in the morning. This method is considered more efficient for capturing mammals of terrestrial or semi-fossorial habits (Umetsu *et al.* 2006). Two sets of pitfall traps were installed in May 2011 and another two additional sets in July 2011, at each sampling site (Table 2).

Survey of medium- and large-sized mammals

Medium and large mammal species richness was surveyed using two approaches: observations in line-transects and camera traps. In the line-transect approach, an observer conducted census over a series of transects previously selected (Cullen and Rudran 2006). In February 2010 and July 2011, a total of 81 line-transect observations were conducted in forested habitats and along the RJ-165 highway. The transects varied in length and altitude. For all observed animals or indirect traces (e.g. burrows, vocalisations, tracks, etc) registered, it were used field guides (Auricchio 1995; Emmons 1997; Becker and Dalponte 1999; Borges and Thomás 2004;

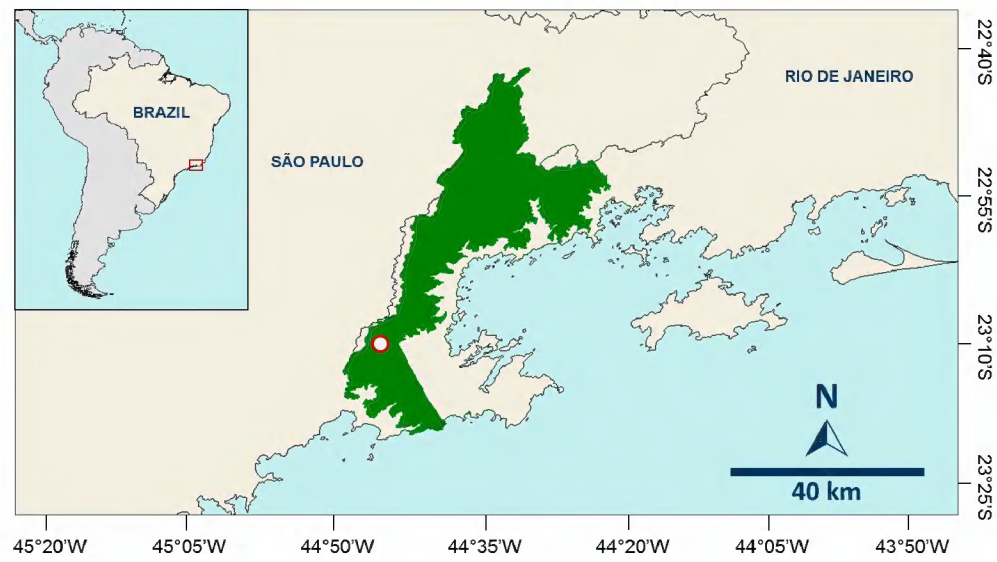

Figure 1. Study area (red circle) in the Serra da Bocaina National Park (green area), States of Rio de Janeiro and São Paulo, southeastern Brazil.

Table 1. Location, altitude, and sampling effort for each transect of live traps for non-volant small mammals along the RJ-165 highway in Serra da Bocaina National Park, state of Rio de Janeiro, Brazil. Datum WGS84 (sites 1 and 2) and SAD69 (site 3).

SITE	TRANSECT	GEOGRAPHIC COORDINATES	ALTITUDE (M)	SAMPLING EFFORT (TRAP-NIGHTS)
1	A	23°11'23" S, 44°50'18" W	1193	150
	B	23°11'24" S, 44°50'19" W	1193	90
2	A	23°11'53" S, 44°50'28" W	1122	150
	B	23°11'55" S, 44°50'24" W	1122	150
3	A	23°12'06" S, 44°49'45" W	803	120
	B	23°12'23" S, 44°49'38" W	731	120

Table 2. Location, altitude, and sampling effort for sets of pitfall traps for non-volant small mammals along the RJ-165 highway in Serra da Bocaina National Park, state of Rio de Janeiro, Brazil. Datum SAD69.

SITE	TRANSECT	GEOGRAPHIC COORDINATES	ALTITUDE (M)	TOTAL SAMPLING EFFORT (TRAP-NIGHTS)
1	A	23°11'22" S, 44°50'15" W	1179	75
	B	23°11'20" S, 44°50'20" W	1170	70
2	A	23°11'54" S, 44°50'38" W	1120	80
	B	23°11'54" S, 44°50'24" W	1101	80
3	A	23°12'06" S, 44°49'49" W	785	75
	B	23°12'18" S, 44°49'33" W	771	75

Oliveira and Cassaro 2005) to identify individuals at the lower taxonomic level (genus or species), following the valid names proposed by Wilson and Reeder (2005). In addition, coordinates, altitude and hour were registered, along with number of individuals, when possible. The identification of armadillo burrows followed Borges and Thomás (2004).

In the second approach, the camera traps were placed 0.5 to 1.0 m above the ground, according to the slope of the terrain, and slightly oriented downwards. They were checked daily to verify their proper operation and replacement of baits when necessary. The bait consisted of pineapple, banana, salt, bacon, sardines and bobcat urine (*Lynx rufus*; Conner *et al.* 1983) placed on the camera's focus. Cameras were automatically triggered by both heat and motion. This method is extremely widespread and suited for population estimates and record of medium to large-sized mammals (Maffei *et al.* 2005; Heilbrun *et al.* 2006; Soisalo and Calvacanti 2006; Lucherini *et al.* 2009). In February 2010, four analogical camera traps (Tigrinus® convencional 6.0) were used. Each one remained active for two consecutive days (48 hours), and then removed and installed elsewhere for other two consecutive days, totalizing eight locations (Table 3). In May 2011 five digital camera traps (Bushnell®), and in July 2011 five digital and four analogical cameras were used. They were installed in different locations with different sampling effort (Table 3).

Survey of bats

Bats were sampled at two sites along the RJ-165 highway, the same sampling sites used in the non-volant small mammals survey (Table 4). Eight mistnets of 9x3 m (Zootech ®) were set at ground level on the trails and clearings in forested habitat and over watercourses, as proposed for Kunz and Kurta (1988). Mistnets remained opened from 18:00 to 24:00 h, concentrating the sampling effort in the period of greatest bat activity (Aguiar and Marinho-Filho 2004). Each sampling site was sampled for two nights and sampling effort were calculated according Straube and Bianconi (2002).

Handling of captured specimens

Animals trapped were identified at species level whenever possible, weighed using spring scales (PesolaTM), sexed, and had their reproductive condition verified. Marsupials and bats were classified according to age (Anthony 1988; Macedo *et al.* 2006). The following data were also recorded for each specimen: the trap station where the animal was captured, measures of head-body and tail lengths for rodents and marsupials, and head-body and forearm lengths for bats. Bats were marked temporarily with holes in dactylopatagium, as proposed by Bonaccorso and Smythe (1972), and marsupials and rodents with holes in one ear. After the handling procedure, animals were released at the same place of capture.

Unidentified non-volant small mammals and the first-captured specimens of each bat species were removed, euthanized, prepared, and deposited at the Museu Nacional, Universidade Federal do Rio de Janeiro.

Unidentified specimens of rodents (Sigmodontinae) had their karyotypes prepared. Chromosomes in metaphases were obtained with *in vitro* culture (culture of bone marrow grown in Dulbecco´s MEM with 10% fetal bovine serum and colchicine). Conventional coloration with Giemsa 5% was used to observe diploid (2n), fundamental autosomal numbers (AN) and chromosome morphology variation. The karyotypes were set, compared with the literature and deposited at the Universidade do Estado do Rio de Janeiro.

Table 3. Geographic coordinates, altitude, sampling effort and sampling period (1= February, 2010; 2= May, 2011; 3= July, 2011) for camera traps used in the survey of medium- and large-sized mammals along the RJ-165 highway in Serra da Bocaina National Park, state of Rio de Janeiro, Brazil. Datum WGS84 for camera traps 1-4, 11, 13-14, and 17; Datum SAD69 for camera traps 5-10, 12, 15-16, and 18.

CAMERA TRAP (CT)	GEOGRAPHIC COORDINATES	ALTITUDE (M)	SAMPLING EFFORT (HOURS)	SAMPLING PERIOD
1	23°10'16" S, 44°50'31" W	1462	48	1
2	23°10'11" S, 44°50'27" W	1450	48	1
3	23°10'47" S, 44°49'52" W	1303	48	1
4	23°11'23" S, 44°50'18" W	1193	48	1
5	23°11'22" S, 44°50'17" W	1190	120	3
6	23°11'24" S, 44°50'14" W	1189	192	2 / 3
7	23°11'18" S, 44°50'19" W	1183	192	2/ 3
8	23°11'52" S, 44°50'23" W	1125	120	3
9	23°11'54" S, 44°50'39" W	1120	120	2
10	23°11"54" S, 44°50'27" W	1112	120	3
11	23°11'23" S, 44°50'38" W	1098	48	1
12	23°11'55" S, 44°50'36" W	1092	120	3
13	23°11'57" S, 44°50'03" W	970	48	1
14	23°11'56" S, 44°49'48" W	851	48	1
15	23°12'05" S, 44°49'48" W	840	192	2 / 3
16	23°12'19" S, 44°49'32" W	772	192	2 / 3
17	23°12'18" S, 44°49'36" W	745	48	1
18	23°12'23" S, 44°49'38" W	739	120	3

Table 4. Geographic coordinates, altitude and sampling effort of the survey of the bats with mistnets along the RJ-165 highway, Serra da Bocaina National Park, state of Rio de Janeiro, Brazil. Datum SAD69.

SITE	GEOGRAPHIC COORDINATES	ALTITUDE (M)	SAMPLE EFFORT (M^2 X H)
2	23°11'52" S, 44°50'24" W	1121	1,296
3	23°12'06" S, 44°49'49" W	785	1,296

Taxonomic classification

The taxonomic classification used in this study follows the proposals of Wilson and Reeder (2005), Gardner (2007a), Reis *et al.* (2007, 2011), Bonvicino *et al.* (2008), and Costa *et al.* (2011).

Results and Discussion

Forty-eight mammal species belonging to nine orders were recorded in SBNP (Table 5), as followed:

Order Chiroptera

Family Phyllostomidae

Subfamily Glossophaginae

***Anoura caudifer* (É. Geoffroy, 1818)**
Distribution. South America; from northern Colombia to northwestern Argentina, except for Chile and Uruguay (Simmons 2005; Nogueira *et al.* 2007a) and the Central Amazon Basin (Griffiths and Gardner 2007). In Brazil it occurs in the biomes of Amazon, Cerrado, Pantanal and Atlantic Forest (Nogueira *et al.* 2007a). **Comments.** It is considered a relatively common species within its geographic range, being captured in areas of continuous forest, small fragments and disturbed areas, including agricultural and urban areas (Nogueira *et al.* 2007a). Two individuals were captured at site 3 (Figures 2 and 3A), in a forested habitat with presence of banana palm trees (Family Musaceae, *Musa paradisiaca* L.). **Voucher specimen.** MN78129 (male).

***Anoura geoffroyi* Gray, 1838**
Distribution. North, Central and South America; from central Mexico to Peru, Bolivia and Brazil (Nogueira *et al.* 2007a). In Brazil it occurs in all the biomes, except for *Campos Sulinos* (Griffiths and Gardner 2007; Nogueira *et al.* 2007a). **Comments.** It is considered a relatively common species within its geographic range, being captured in areas of continuous and secondary forests, and in agricultural and urban areas (Bredt and Uieda 1996; Esbérard 2003). Five individuals were captured at site 3 (Figures 2 and 3B) in a forested habitat. **Voucher specimen.** MN78132 (male).

Subfamily Phyllostominae

***Chrotopterus auritus* (Peters, 1856)**
Distribution. North, Central and South America (Williams and Genoways 2007). In Brazil it occurs in all the biomes (Nogueira *et al.* 2007b). **Comments.** Although widely distributed, it is a poorly sampled species and is considered an indicator of habitat quality (Fenton *et al.* 1992). In Brazil it is classified as vulnerable only in the state of Paraná (Machado *et al.* 2008). One individual was captured at site 2 (Figures 2 and 3C), on an abandoned dirt road surrounded by forested habitat. **Voucher specimen.** MN78127 (female).

***Lonchorhina aurita* (Tomes, 1863)**
Distribution. North, Central and South America; from Mexico to Bolivia and Brazil, except for southern Brazil (Williams and Genoways 2007; Nogueira *et al.* 2007b). In Brazil it occurs in all the biomes (Marinho-Filho and Sazima 1998). **Comments.** Although widely distributed, it is a poorly captured species, being frequently associated with preserved forest habitats and the presence of caves (Handley and Ochoa 1997). Two individuals were captured at site 3 (Figures 2 and 3D), above a watercourse in a preserved forested habitat. **Voucher specimen.** MN78128 and MN78131 (females).

***Tonatia bidens* (Spix, 1823)**
Distribution. South America; from northern Brazil to northern Argentina and Paraguay (Nogueira *et al.* 2007b). In Brazil it occurs in the biomes of Atlantic Forest, Caatinga, Cerrado, and Pantanal (Williams *et al.* 1995; Nogueira *et al.* 2007b). **Comments.** It occurs in a variety of habitats (Sekiema *et al.* 2001; Esbérard and Bergallo 2004). One individual was captured at site 3 (Figures 2 and 3E), near a house located at a secondary forest habitat with the presence of banana palm trees. It is considered data deficient for the establishment of the level of endangerment by IUCN (2011). **Voucher specimen.** MN77799 (male).

Subfamily Carolliinae

***Carollia perspicillata* (Linnaeus, 1758)**
Distribution. Central and South America, and some Caribbean islands (McLellan and Koopman 2007). In Brazil it occurs in all the biomes (Filho *et al.* 2007). **Comments.** It is considered a common species, occurring in a variety of habitats (Lima and Reis 2004; Thies and Kalko 2004). Twenty-seven individuals were captured at sites 2 and 3 (Figures 2 and 3F), in forested habitat with presence of banana palm trees. **Voucher specimen.** MN781130 and MN78133 (females).

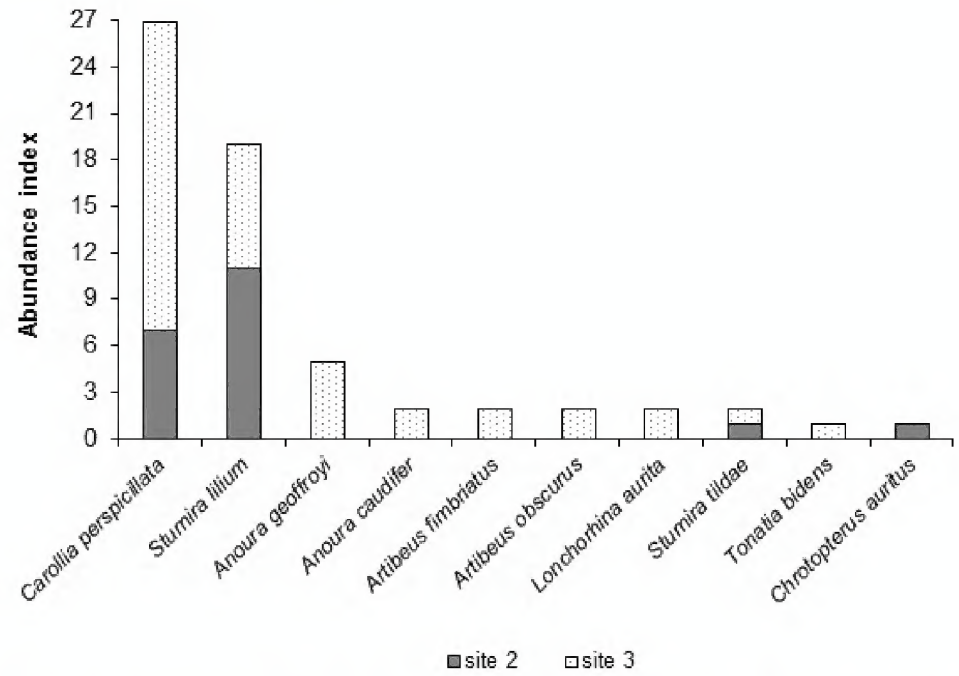

Figure 2. An abundance index for bat species captured in Serra da Bocaina National Park, state of Rio de Janeiro, southeastern Brazil.

Figure 3. Bat species registered in the Serra da Bocaina National Park, State of Rio de Janeiro, Brazil: A) *Anoura caudifer*; B) *Anoura geoffroyi*; C) *Chrotopterus auritus*; D) *Lonchorhina aurita*; E) *Tonatia bidens*; F) *Carollia perspicillata*; G) *Artibeus fimbriatus*; H) *Artibeus obscurus*; I) *Sturnira lillium*; J) *Sturnira tildae*. Photos by Roberto L. M. Novaes.

Subfamily Stenodermatinae

***Artibeus fimbriatus* Gray, 1838**
Distribution. South America; in Brazil, Paraguay and Argentina (Barquez *et al.* 1999; Marques-Aguiar 2007). In Brazil it occurs in the biomes of Atlantic Forest, Cerrado and Pantanal (Zortéa 2007). **Comments.** It is frequently associated with forested habitats, occurring rarely in disturbed areas (Zortéa 2007; Pacheco *et al.* 2010). Two individuals were captured at site 3 (Figures 2 and 3G), at a secondary forested habitat with banana palm trees. **Voucher specimen.** MN77796 (male).

***Artibeus obscurus* (Schinz, 1821)**
Distribution. South America; from Venezuela and Colombia to southern Brazil (Marques-Aguiar 2007; Zortéa 2007). In Brazil it occurs in all the biomes, except Pantanal and *Campos Sulinos* (Zortéa 2007). **Comments.** Its occurrence is frequently associated with preserved and wet forest habitats (Handley 1976; Simmons and Voss 1998), also occurring in urban areas (Zortéa 2007). Two individuals were captured at site 3 (Figures 2 and 3H) in a preserved forested habitat. **Voucher specimen.** MN77797 (female).

***Sturnira lillium* (É. Geoffroy, 1810)**
Distribution. North, Central and South America; from Mexico to northwestern Argentina, and the Lesser Antilles (Gardner 2007b). In Brazil it occurs in all the biomes (Zortéa 2007). **Comments.** It is considered a common species, occurring in a diversity of habitats (Evelyn and Stiles 2003). Nineteen individuals were captured at sites 2 and 3 (Figures 2 and 3I) in preserved forested habitats. **Voucher specimen.** MN78134 (male) and MN78135 (female).

***Sturnira tildae* de la Torre, 1959**
Distribution. South America; from Colombia to Bolivia and southeastern Brazil (Simmons 2005; Gardner 2007b). In Brazil it occurs in the Amazon, Pantanal and Atlantic Forest biomes, although the limits of its geographic distribution are poorly known (Zortéa 2007). **Comments.** It is a poorly sampled species, probably because of the common misidentification, since this species is very similar to the sympatric *S. lilium*. It is frequently associated with the understory of forested habitats, also occurring in disturbed habitats (Brosset and Charles-Dominique 1990; Simmons and Voss 1998). Two individuals were captured at sites 2 and 3 (Figures 2 and 3J), in preserved forested habitats. **Voucher specimen.** MN77799 (male).

Order Carnivora

Family Canidae

***Cerdocyon thous* (Linnaeus, 1766)**
Distribution. Panama in Central America (Tejera *et al.* 1999); South America, except for the Amazon Basin and west of the Andes (Chile, Peru and Ecuador) (Berta 1982; Emmons 1997; Courtenay and Maffei 2008). In Brazil it occurs in all the biomes, except for the Central Amazon Basin (Cheida and Santos 2010). In the Amazon Basin, its distribution is limited to areas northeast of the Rio Amazon and Rio Negro, southeast of the Rio Amazon and Rio Araguaia, and south of Rio Beni, Bolivia (Courtenay and Maffei 2008). **Comments.** One individual was observed at 18:40 h on a paved extension of the RJ-165 highway (*Datum* WGS84: 23°09'49" S, 44°50'29" W). It is considered a common species in Brazil, with one of the highest roadkill rates on the highways of Brazil (Cherem *et al.* 2007; Hengemuhle and Cademartori 2008; Turci and Bernarde 2009; Cheida *et al.* 2011).

Family Felidae

***Leopardus pardalis* (Linnaeus, 1758)**
Distribution. North, Central and South America; from Mexico to Argentina, except for Chile (Caso *et al.* 2008). In Brazil it occurs in all the biomes (Cheida and Santos 2010). **Comments.** Tracks were registered at site 2 (*Datum* SAD69: 23°11'17.7" S, 44°50'28.4" W, 1,102 m.a.s.l.; 23°11'18.5" S, 44°50'31.9" W, 1,111 m.a.s.l.; 23°11'19.6" S, 44°50'34.5" W, 1,095 m.a.s.l.; 23°11'18.3" S, 44°50'31.6" W, 1,140 m.a.s.l.). In Brazil it is considered vulnerable at regional and national levels (Bergallo *et al.* 2000; Machado *et al.* 2008; SMASP 2009).

***Leopardus tigrinus* (Schreber, 1775)**
Distribution. Costa Rica and Panama in Central America; from Venezuela to northeastern Argentina in South America, except for Chile and Uruguay (Oliveira *et al.* 2008). In Brazil it occurs in all the biomes, except for *Campos Sulinos* (Cheida *et al.* 2011). **Comments.** Tracks were registered at site 2 (*Datum* SAD69: 23°11'17.9" S, 44°50'22.2" W, 1,121 m.a.s.l.; Figure 4A). In Brazil it is considered vulnerable at regional and national levels (Bergallo *et al.* 2000; Machado *et al.* 2008; SMASP 2009), and by the IUCN (2011).

***Puma concolor* (Linnaeus, 1771)**
Distribution. North, Central and South America, except for Alaska and northern and eastern Canada (Emmons 1997; Machado *et al.* 2008; Oliveira and Cassaro 2008;Cheida and Santos 2010). In Brazil it occurs in all the biomes (Machado *et al.* 2008; Oliveira and Cassaro 2008; Cheida and Santos 2010). **Comments.** Tracks were found at site 1 (*Datum* SAD69: 23°10'28.6" S, 44 °50'24.5" W; Figure 4B) and one individual was observed at 21:20h in a forested habitat at site 3 (*Datum* WGS84: 23°12'15" S, 44°49'38" W). Observations of this species in the wild are infrequent, because of its low population density in tropical forests (Kelly *et al.* 2008). In a previous study this was the third species of large-sized mammal with the highest number of records in the SBNP (B.F. Leopoldo unpublished data). In Brazil it is considered vulnerable at regional and national levels (Bergallo *et al.* 2000; Machado *et al.* 2008; SMASP 2009).

Family Mustelidae

***Eira barbara* (Linnaeus, 1758)**
Distribution. Central and South America; from southern Mexico to northern Argentina (Emmons 1997). In Brazil it occurs in all the biomes, except for *Campos Sulinos* (Cheida

and Santos 2010). C**omments.** One individual was seen during the line-transect observations in a forested habitat characterized by medium-sized trees and open understory (23°11'58" S, 44°50'25" W, 1,059 m.a.s.l.).

Family Procyonidae

***Nasua nasua* (Linnaeus, 1766)**
Distribution. Throughout South America; from Colombia and Venezuela to Uruguay and northern Argentina (Emmons and Helgen 2008). In Brazil it occurs in all the biomes (Cheida *et al.* 2011). **Comments.** It was registered by camera trap (CT 15 in Table 3; Figure 5A) in a forested habitat near a watercourse with small cascades.

Order Cingulata

Family Dasypodidae

***Dasypus novemcinctus* Linnaeus, 1758**
Distribution. North, Central and South America; from southern United States of America to northwestern Argentina and Uruguay, the Lesser Antilles (Grenada) and Trinidad and Tobago (Emmons 1997; Gardner 2005a; Wetzel *et al.* 2007; Medri *et al.* 2010a). In Brazil it occurs in all the biomes (Medri *et al.* 2010a). **Comments.** One individual was observed at night crossing the highway, in a forested habitat characterized by medium-sized trees and dense understory (23°10'16" S, 44°50'19" W, 1,430 m.a.s.l.). Other two individuals were registered by camera trap (CT 16 in Table 3; Figure 5B) in a forested habitat near a watercourse, at 21:50 and 02:40 h, respectively.

***Euphractus sexcinctus* (Wagler, 1830)**
Distribution. South America; from southern Suriname to Uruguay and northern Argentina (Medri and Superina 2010). In Brazil it occurs in all the biomes (Wetzel *et al.* 2007; Medri *et al.* 2010a). **Comments.** The species was registered by the presence of burrows at sites 2 (*Datum* SAD69: 23° 11'20.3" S, 44°50'34.6" W, 1,108 m.a.s.l., in a forested habitat) and 3 (*Datum* SAD69: 23°11'32.5" S, 44°49'46.5" W, 785 m.a.s.l., in a forested habitat with presence of banana palm trees).

Figure 4. Tracks of medium and large sized mammal species registered in the Serra da Bocaina National Park, State of Rio de Janeiro, Brazil: A) *Leopardus tigrinus*; B) *Puma concolor*; C) *Cuniculus paca*; D) *Dasyprocta leporina*. Photos by Nadjha R. Vieira (B, C) and Ana C. Delciellos (A, D).

Order Pilosa

Family Myrmecophagidae

***Tamandua tetradactyla* (Linnaeus, 1758)**
Distribution. South America; east of the Andes, except for southern Argentina and Uruguay (Emmons 1997; Gardner 2005b; Medri *et al.* 2010b; Miranda and Meritt 2011). In Brazil it occurs in all the biomes (Medri *et al.* 2010b). **Comments.** One individual was registered by camera trap (CT 14 in Table 3; Figure 5C), in a forested habitat characterized by steep terrain, large-sized trees and open understory, distanced approximately 70 m of a watercourse with small cascades.

Order Didelphimorphia

Family Didelphidae

***Chironectes minimus* (Zimmermann, 1780)**
Distribution. From southern Mexico in North America to South America, except for Bolivia, Chile, Uruguay and southern Argentina (Gardner 2005c). In South America the species has a disjunct distribution (Stein and Patton 2007). This species occurs in central, southern and southeastern Brazil, and also in the states of Amapá and Pará (Rossi *et al.* 2010). **Comments.** One individual was observed in a bush, in a forested habitat near a watercourse (23°12'06" S, 44°49'44" W). It is classified as near threatened in the state of São Paulo, Brazil (SMASP 2009).

***Didelphis aurita* Wied-Neuwied, 1826**
Distribution. Along the coastline throughout the extension of the Brazilian Atlantic Forest, from the state of Paraíba to the state of Rio Grande do Sul, and southern state of Mato Grosso do Sul (Rossi *et al.* 2010; Astúa de Moraes *et al.* 2011); southeastern Paraguay and northeastern Argentina (Gardner 2005c; Cerqueira and Tribe 2007; Astúa de Moraes *et al.* 2011). **Comments.** It was the most abundant marsupial captured (Figures 6 and 7A). It was captured exclusively with Tomahawk live traps on sites 1A-B, 2A-B, and 3A. Also, nine individuals were registered by camera traps (CT 5, 7, 10, and 15 in Table 3; Figure 5D); and two individuals were observed crossing the highway at 18:20 h (23°11"23" S, 44°50'18" W) and 20:50 h, respectively (*Datum* SAD69: 23°09'46.0" S, 44°50'04.5" W). The species was also registered by tracks (*Datum* SAD69: 23°11'49.6" S, 44°49'36.8" W and 23°11'18.3" S, 44°50'31.6" W). In Brazil it is considered a common species occurring in a variety of habitats, including disturbed areas (Rossi and Bianconi 2011).

***Gracilinanus microtarsus* (Wagner, 1842)**
Distribution. Brazilian Atlantic Forest; from the state of Minas Gerais to the state of Santa Catarina (Creighton and Gardner 2007; Rossi *et al.* 2010); northeastern Argentina (Teta *et al.* 2007; Brito *et al.* 2008a). Recently, it was registered in the Chapada Diamantina, expanding the species' distribution to the northern state of Bahia in a transition zone between semideciduous Atlantic Forest and Cerrado, and in areas of Cerradão (Geise and Astúa 2009). **Comments.** One individual was captured with a pitfall trap at site 2B (Figures 6 and 7B). It is classified as near threatened in the state of São Paulo, Brazil (SMASP 2009).

***Marmosops* sp.**
Comments. Two species of *Marmosops* can potentially occur in the region of SBNP, *M. incanus* and *M. paulensis* (Gardner and Creighton 2007; Brito *et al.* 2008b, c). *Marmosops incanus* is classified as presumably threatened and *M. paulensis* as vulnerable in the state of São Paulo (SMASP 2009), whereas *M. paulensis* is presumably threatened in the state of Rio de Janeiro (Bergallo *et al.* 2000). Both species are endemic to the Brazilian Atlantic Forest (Brito *et al.* 2008b, c). Four individuals were captured with Sherman live traps at sites 1A and 2A-B, and one with a pitfall trap at site 1B (Figures 6 and 7C).

***Metachirus nudicaudatus* (É. Geoffroy, 1803)**
Distribution. From southern Mexico in North America to Paraguay and northeastern Argentina (Gardner and Dagosto2007; Brito *et al.* 2011). In Brazil it occurs in all the biomes, except for the driest regions of Cerrado and Caatinga (Rossi *et al.* 2010; Brito *et al.* 2011). **Comments.** Two individuals were captured with Tomahawk live traps at sites 2B e 3B (Figures 6 and 7D). It is classified as near threatened in the state of São Paulo, Brazil (SMASP 2009). The occurrence of this species is frequently associated with forested habitats with open canopy and understory (Moura *et al.* 2005).

***Monodelphis americana* (Müller, 1776)**
Distribution. Eastern Brazil, from the state of Pará to the state of Santa Catarina (Gardner 2005c; Pine and Handley 2007; Brito and Astúa de Moraes 2008). **Comments.** One individual was captured with a pitfall trap at site 3A (Figures 6 and 7E), in a forested habitat with presence of banana palm trees. It is classified as near threatened in the state of São Paulo, Brazil (SMASP 2009). **Voucher specimen.** MN77794 (female).

***Philander frenatus* (Olfers, 1818)**
Distribution. Brazilian Atlantic Forest, from the state of Bahia to the northern state of Rio Grande do Sul (Rossi *et al.* 2010); Paraguay and Argentina (Gardner 2005c; Patton and Silva 2007). **Comments.** Three individuals were captured at site 3A with Tomahawk live traps (Figures 6 and 7F), characterized by forested habitat and a nearby watercourse. The association of this species with habitats characterized by great abundance of rocks and presence of watercourses was already found in previous studies (Moura *et al.* 2005). However, this species is also often described as a habitat generalist and able to cross open habitats in fragmented landscapes (Pires *et al.* 2002; Lira *et al.* 2007). The species was also registered by camera traps at sites 1 and 3 (CT 5 and 15 in Table 3; Figure 5E).

Order Artiodactyla

Family Cervidae

***Mazama* sp.**
Comments. Two species of *Mazama* can potentially occur

in the region of SBNP, *M. Americana* (Durate *et al.* 2008) and *M. gouazoupira* (Black and Vogliotti 2008). *Mazama americana* is classified as data deficient by IUCN (2011), and both species are endangered in the state of Rio de Janeiro (Bergallo *et al.* 2000; Machado *et al.* 2008). Tracks of *Mazama* sp. were registered at site 2 (*Datum* SAD69: 23°11'18.3" S, 44°50'31.6" W, 1,140 m.a.s.l.).

Family Tayassuidae

***Tayassu pecari* (Link, 1795)**

Distribution. From southern Mexico to northern Argentina, except for Chile and Uruguay (Emmons 1997; Tomas *et al.* 2010). In Brazil it occurs in all the biomes, except in the semiarid region of Caatinga (Tomas *et al.* 2010). **Comments.** Two canines were obtained with a local hunter, although it was not possible to specify the date when the specimen was hunted. It is considered near threatened by IUCN (2011) and endangered in the states of Rio de Janeiro and São Paulo, Brazil (Bergallo *et al.* 2000; SMASP 2009). It was one of the most abundant species in the study of Leopoldo (unpublished data) in the same region.

Figure 5. Mammal species registered by camera traps in the Serra da Bocaina National Park, State of Rio de Janeiro, Brazil: A) *Nasua nasua*; B) *Dasypus novemcinctus*; C) *Tamandua tetradactyla*; D) *Didelphis aurita*; E) *Philander frenatus*; F) *Cuniculus paca*.

Order Primates

Family Cebidae

***Callithrix aurita* (Humboldt, 1812)**
Distribution. Brazilian Atlantic Forest, in high altitude regions of the states of Rio de Janeiro, São Paulo and southeastern Minas Gerais (Rylands *et al.* 2008a; Gregorin *et al.* 2010; Norris *et al.* 2011). **Comments.** It is considered vulnerable on regional and national levels (Bergallo *et al.* 2000; Machado *et al.* 2008; SMASP 2009) and by the IUCN (2011). A group of this species was observed, including hybrid individuals. The hybridization with the non-native *Callithrix jacchus* and *C. penicillata* is the major threat to this species (Machado *et al.* 2008; Rylands *et al.* 2008a).

***Callithrix jacchus* (Linnaeus, 1758)**
Distribution. Brazilian Atlantic Forest and Caatinga; from the state of Maranhão to the state of Bahia (Rylands *et al.* 2008b; Gregorin *et al.* 2010). Also, it was introduced in the southeastern Brazil (Rylands *et al.* 2008b). **Comments.** A group of at least three individuals was observed in a forested habitat at site 3 at 12:00h (*Datum* SAD69: 23°11'18.3" S, 44°50'31.6" W, 253 m.a.s.l.).

Family Atelidae

***Alouatta guariba* (Humboldt, 1812)**
Distribution. Brazil, from the state of Bahia to the state of Rio Grande do Sul, in habitats of dense evergreen forest and semideciduous forest; northeastern Argentina (Mendes *et al.* 2008). **Comments.** Classified as near threatened in the state of São Paulo, Brazil (SMASP 2009). The species was registered five times by the characteristic vocalization during line-transect observations between 07:30 h and 13:30 h (*Datum* WGS84: 23°11'59" S, 44°50'17" W; 23°11'53" S, 44°50'28" W; *Datum* SAD69: 23°11'19.6" S, 44°50'45.8" W; 23°11'18.5" S, 44°50'26.0" W; 23°11'49.4" S, 44°49'36.1" W; 23°11'43.1" S, 44°49'32.7" W).

Order Rodentia

Family Sciuridae

Subfamily Sciurinae

***Guerlinguetus ingrami* Grey, 1821**
Distribution. Southeastern Brazil, from the south of the state of Bahia to the north of the state of Rio Grande do Sul (Bonvicino *et al.* 2008). **Comments.** It was observed twice during line-transect observations, during the day, near a watercourse, in a forested habitat characterized by medium- and large-sized trees and dense understory (23°11'55" S, 44°50'39" W, 1,100 m.a.s.l.) and at site 3 (*Datum* SAD69: 23°11'45.3" S, 44°49'32.0" W, 779 m.a.s.l.) at 08:53 h.

Family Cricetidae

Subfamily Sigmodontinae

***Akodon cursor* Winge, 1887**
Distribution. Along the coastline throughout the extension of the Brazilian Atlantic Forest, from the state of Paraíba to the state of Paraná, and eastern state of Minas Gerais (Bonvicino *et al.* 2008; Geise 2012). **Comments.** One individual was captured at site 3B with a pitfall trap (Figure 6). The occurrence of this species is frequently associated with open habitats (Barros-Battesti *et al.* 2000; Pires *et al.* 2002) and it is able to establish a single population in fragmented landscapes by using the matrix surrounding the forest fragments (Pires *et al.* 2002). **Voucher specimen.** MN77792 (female, 2n=14, AN=20).

***"Akodon serrensis"* Thomas, 1902**
Distribution. Brazil, from the state of Espírito Santo to the north of the state of Rio Grande do Sul (Bonvicino *et al.* 2008) and Argentina (Pereira *et al.* 2005). **Comments.** The limits of its geographical distribution are considered uncertain (Pardinas *et al.* 2008). Three individuals were captured in the two sites with high altitude (1B and 2A) with live traps placed on the forest floor (Figure 6). It is classified as near threatened in the state of São Paulo, Brazil (SMASP 2009). **Voucher specimen.** MN77791 (female, 2n=46, AN=46).

***Blarinomys breviceps* Thomas, 1979**
Distribution. From the state of Bahia in Brazil to the Misiones province in Argentina (Geise *et al.* 2008). **Comments.** One individual was captured with a pitfall trap at site 2A (Figures 6 and 7G), located in a bamboo-dominated habitat. In Brazil it is classified as presumably extinct in the state of Rio de Janeiro (Bergallo *et al.* 2000) and data deficient in the state of São Paulo (SMASP 2009). The rarity of this species may be partly the result of a sampling artefact, caused by the infrequent use of pitfall traps in mammalogical surveys in the past, associated with its fossorial and insectivore specialized habits (Geise *et al.* 2008). **Voucher specimen.** MN77786 (female, 2n=28).

***Delomys dorsalis* Hensel, 1873**
Distribution. Brazil, from the south of the state of Espírito Santo to the north of the state of Rio Grande do Sul and east of the state of Minas Gerais (Bonvicino *et al.* 2008). **Comments.** Twenty individuals of the genus *Delomys* were captured with Sherman and Tomahawk live traps at sites 1A-B and 2A-B, and pitfall traps at site 2B (Figures 6 and 7H). Two individuals captured at site 1A, and with karyotypes studied, were identified as *D. dorsalis*. However, two morphologically similar species of this genus can potentially occur in the region of SBNP, *D. dorsalis* and *D. sublineatus* (Bonvicino *et al.* 2008). *Delomys dorsalis* is endemic of the Atlantic Forest, and it is frequently found in forests located at high altitudes (Oliveira and Bonvicino 2011). It is classified as near threatened in the state of São Paulo, Brazil (SMASP 2009). **Voucher specimens.** MN77787 and MN77788 (females, 2n=82, AN=80).

***Euryoryzomys russatus* (Wagner, 1848)**
Distribution. Along the coastline, throughout the extension of the Brazilian Atlantic Forest; from the south of the state of Bahia to the north of the state of Rio Grande do Sul and eastern state of Minas Gerais (Bonvicino *et al.*

2008). **Comments.** It was abundant, and the only species captured at all three sampling sites (1A-B, 2B, and 3B; Figure 6). Individuals were captured with Tomahawk and Sherman live traps. It is classified as vulnerable at the state of São Paulo, Brazil (SMASP 2009).

***Juliomys rimofrons* Oliveira and Bonvicino, 2002**
Distribution. Endemic to the Brazilian Atlantic Forest, it is known by three individuals captured at high altitudes forests at the Municipality of Itamonte, state of Minas Gerais (Oliveira and Bonvicino 2002). Apparently, it has already been registered at Serra da Bocaina, in the states of São Paulo and Rio de Janeiro (Bonvicino and Geise 2008), but previous studies and voucher specimens for this locality are apparently not available (Pavan and Leite 2011). Thus, this individual represents a case of geographic distribution expansion. **Comments.** One individual was captured with a pitfall trap at sampling site 3A (Figure 6) in a forested habitat with presence of banana palm trees. It is considered a rare species and vulnerable by IUCN (2011). **Voucher specimen.** MN77793 (male).

***Oecomys catherinae* Thomas, 1906**
Distribution. Brazilian Atlantic Forest, from the states of Paraíba to Santa Catarina and along riverine forests in the Cerrado and Caatinga regions, with poorly documented limits (Asfora *et al.* 2011). **Comments.** One individual was captured with a Sherman live trap at site 3A (Figure 6). It is classified as data deficient in the state of São Paulo, Brazil (SMASP 2009).

***Oligoryzomys flavescens* (Whaterhouse, 1837)**
Distribution. Eastern Paraguay, Uruguay, northern to south-central Argentina and from the state of Bahia to the state of Rio Grande do Sul, in Brazil (Weksler *et al.* 2008). **Comments.** Two individuals were captured at sites 1A and 3A-B with pitfall traps (Figures 6 and 7I).

***Rhipidomys itoan* Costa, Geise, Pereira and Costa, 2011**
Distribution. This recently described species is found in the states of Rio de Janeiro and eastern São Paulo, to the south of Serra da Mantiqueira, including coastal islands such as Ilha Grande and Ilha da Marambaia. Its northernmost occurrence was recorded in the Municipality of Cachoeiras de Macacu, state of Rio de Janeiro, occurring exclusively in the Atlantic Forest (Costa *et al.* 2011). **Comments.** Four individuals were captured with Sherman live traps at sites 1A-B and 2A (Figure 6).

***Thaptomys nigrita* (Lichtenstein, 1830)**
Distribution. Brazilian Atlantic Forest, from the state of São Paulo to the state of Rio Grande do Sul; northeastern Argentina and eastern Paraguay (Patton *et al.* 2008). **Comments.** One individual was captured with a pitfall trap at site 1B (Figure 6). It is classified as vulnerable in the states of São Paulo (SMASP 2009) and Rio de Janeiro (Bergallo *et al.* 2000), in Brazil. **Voucher specimen.** MN77795 (female).

Family Caviidae

Subfamily Caviinae

***Cavia fulgida* (Wagler, 1831)**
Distribution. Brazil, from the southeast of the state of Minas Gerais to the north of the state of Santa Catarina, and southeast of the state of Mato Grosso do Sul (Bonvicino *et al.* 2008). **Comments.** Two individuals were observed crossing the highway. One individual was observed at 18:00 h in a forested habitat (*Datum* WGS84: 23°11'23" S, 44°50'18" W, 848 m.a.s.l.); the other, crossing from a forested habitat to an open area with high grass (*Datum* WGS84: 23°11'53" S, 44°50'28" W, 735 m.a.s.l.).

Family Cuniculidae Miller and Gidley, 1918

***Cuniculus paca* (Linnaeus, 1766)**
Distribution. North, Central, and South America; from Mexico to Argentina (Woods and Kilpatrick 2005). In Brazil it occurs in all the biomes (Oliveira and Bonvicino 2011). **Comments.** Two individuals were registered by camera trap in a forested habitat characterized by the proximity of a watercourse with small cascades (CT 15 in Table 3; Figures 4C and 5F). In Brazil it is classified as vulnerable in the state of Rio de Janeiro (Bergallo *et al.* 2000) and near threatened in the state of São Paulo (SMASP 2009).

Family Dasyproctidae Bonaparte, 1838

***Dasyprocta leporina* (Linnaeus, 1758)**
Distribution. Brazil, in the Amazon Basin south of the Amazon River, and from the state of Paraiba to the state of São Paulo (Oliveira and Bonvicino 2011). It is also found in Venezuela, the Guianas, Trinidad and Tobago, and Lesser Antilles (Emmons and Reid 2008). **Comments.** Tracks were registered at sites 2 (*Datum* SAD69: 23°11'17.9" S, 44°50'22.2" W, 1,121 m.a.s.l.; 23°11'18.5" S, 44°50'31.9" W, 1,111 m.a.s.l.; Figure 4D) and 3 (*Datum* SAD69: 23°11'43.3" S, 44°49'32.8" W, 747 m.a.s.l.).

Family Erethizontidae Bonaparte, 1845

***Sphiggurus villosus* F. Cuvier, 1823**
Distribution. Brazil, from the state of Rio de Janeiro to the state of Rio Grande do Sul and the state of Minas Gerais (Bonvicino *et al.* 2008). **Comments.** One individual was seen during line-transect observations in a forested habitat characterized by high and closed canopy, and presence of bamboo (23°11'17.4" S, 44°50'19.2" W, 1,132 m.a.s.l.).

Family Echimyidae

Subfamily Eumysopinae

***Trinomys* sp.**
Comments. Two species of *Trinomys* can potentially occur in the region of SBNP, *T. dimidiatus* and *T. iheringi* (Bonvicino *et al.* 2008; Attias *et al.* 2009). *Trinomys dimidiatus* is classified as data deficient in the state of São Paulo (SMASP 2009), and *T. iheringi* as endangered in the state of Rio de Janeiro (Bergallo *et al.* 2000). Both species are endemic to the Brazilian Atlantic Forest (Bonvicino *et al.* 2008). Two individuals of *Trinomys* sp. were captured with Tomahawk livetraps at sites 2B and 3A (Figure 7J).

Order Lagomorpha

Family Leporidae

***Sylvilagus brasiliensis* (Linnaeus, 1758)**
Distribution. North, Central and South America; from southern Mexico to northern Argentina and southern Brazil (Emmons 1997; Zanon and Reis 2010). In Brazil it occurs in all the biomes (Oliveira and Bonvicino 2011).
Comments. Two individuals were observed at night crossing the highway during line-transect observations. One individual was observed near a forested habitat characterized by small-sized trees and abundant grass (23°10'59" S, 44°50'08" W, 1,249 m.a.s.l.); the other, near a forested habitat characterized by medium-sized trees and presence of grass close to a small watercourse (23°12'27" S, 44°49'37" W, 716 m.a.s.l.).

Non-volant small mammals: A total of 67 individuals belonging to 17 species of non-volant small mammals were captured with pitfall and live traps (Figure 6 and Table 5). Previous studies on parasites of small mammals carried out in SBNP also recorded *Akodon montensis*, *Delomys sublineatus*, *Oligoryzomys nigripes*, and *Monodelphis scalops* (Moraes *et al.* 2003; Silva *et al.* 2007), which were not recorded in the present study. In the present study, *Didelphis aurita* was the most abundant marsupial species and *Delomys* the most abundant genus among rodents. The other species were rare, with one to four individuals captured (Figure 6). *Cavia fulgida*, *Chironectes minimus*, and *Guerlinguetus ingrami* were registered by visual observation. This total of 20 species registered corresponds to 32.9% of all non-volant small mammal species of potential occurrence in the study area according to previous lists for Atlantic Forest mammals (IBAMA 2001; Bonvicino *et al.* 2008; Reis *et al.* 2011). Although the species richness found can be considered relatively low, given the number of species with potential occurrence in the region, the use of live traps on the floor and in the understory, as well as pitfall traps, allowed the capture of species with a variety of ecological habits. An important record was the one of *Blarinomys breviceps*, a species classified as presumably extinct in the state of Rio de Janeiro (Bergallo *et al.* 2000), but also recently captured in two municipalities of the same state, Valença and Mauá (Geise *et al.* 2008). Also, the record of *Juliomys rimofrons* in the Municipality of Paraty, state of Rio de Janeiro, represents an expansion of its geographic distribution.

Mammals of medium and large size: We recorded 18 species of medium- and large-sized mammals (MLSM) in SBNP (Table 5), corresponding to 45% of the species of MLSM of potential occurrence in the study area according to previous lists for Atlantic Forest mammals (IBAMA 2001; Bonvicino *et al.* 2008; Reis *et al.* 2011; B.F. Leopoldo unpublished data). Most species recorded are described as common (Emmons 1997; Gardner 2007; Reis *et al.* 2011). In fact, quick inventories of mammals characteristically record mainly the most abundant species in the sampled area, since most of the Brazilian mammal species are shy and nocturnal (Becker and Dalponte 1999). A recent study recorded 23 species of MLSM in SBNP (B.F. Leopoldo, unpublished data), including 13 of the 17 species recorded in the present study. The species *Euphractus sexcinctus*, *Sphiggurus villosus*, *Sylvilagus brasiliensis*, and *Tamandua tetradactyla* were registered in the present study but not by B.F. Leopoldo (unpublished data). Thus, the community of MLSM on SBNP can be considered rich, which was expected given the large extension of continuous Atlantic Forest in the park. However, 41.2% of the recorded MLSM species are endangered at regional and/or national levels (Bergallo *et al.* 2000; Machado *et al.* 2008; SMASP 2009). Among these species, *Puma concolor* is a top predator, and its presence in the study area suggests that the populations of their usual medium- and large-sized preys, such as *Mazama* sp., *Cuniculus paca*, *Nasua nasua*, *Hydrochoerus hydrochaeris*, *Pecari tajacu*, and *Tayassu pecari* (Cheida *et al.* 2011) are probably also present in the region. Indeed, these species were recorded in the previous study by B.F. Leopoldo (unpublished data).

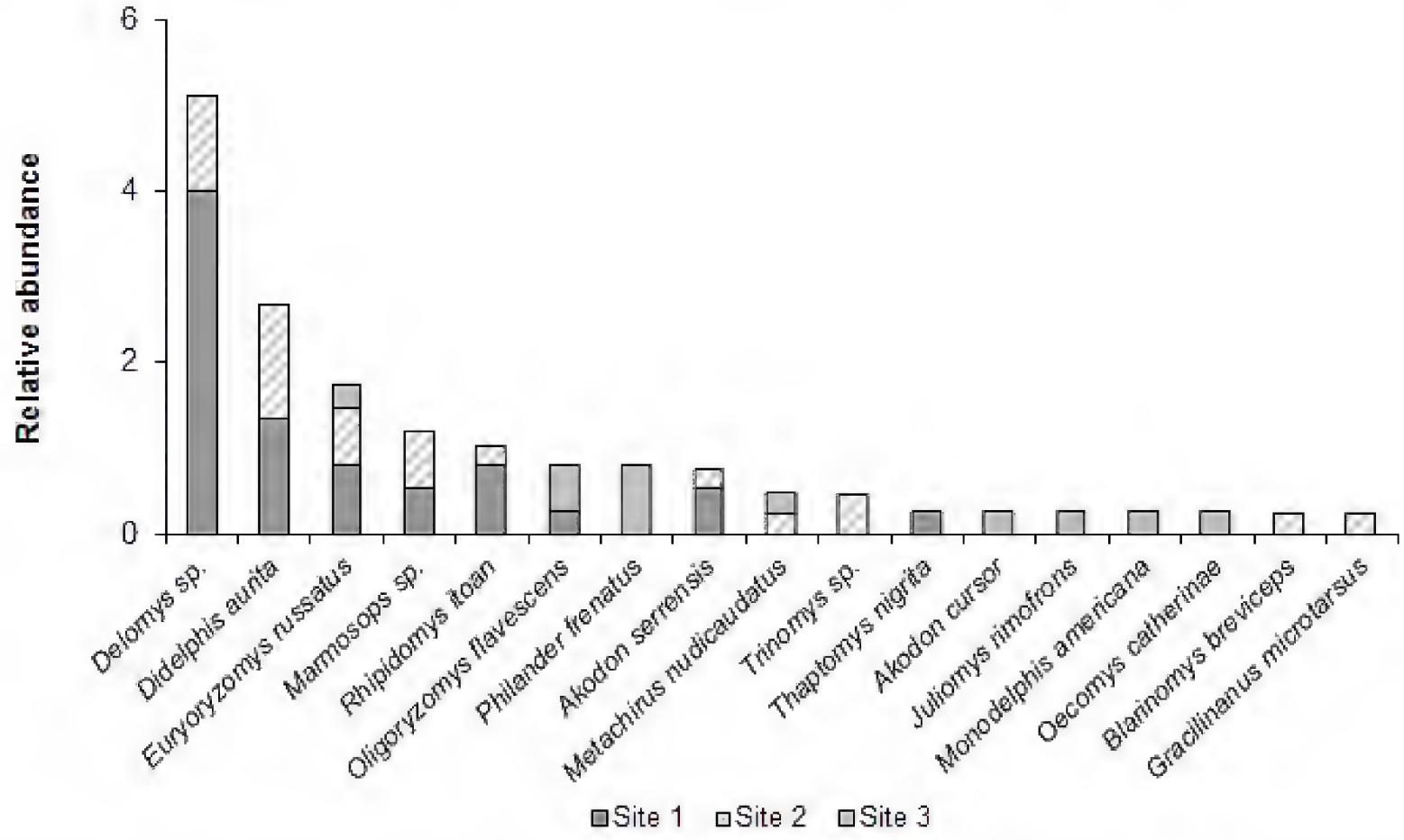

FIGURE 6. Relative abundance of non-volant small mammals captured in Serra da Bocaina National Park, state of Rio de Janeiro, Brazil.

Figure 7. Non-volant mammal species registered in the Serra da Bocaina National Park, State of Rio de Janeiro, Brazil: A) *Didelphis aurita*; B) *Gracilinanus microtarsus*; C) *Marmosops* sp.; D) *Metachirus nudicaudatus*; E) *Monodelphis americana*; F) *Philander frenatus*; G) *Blarinomys breviceps*; H) *Delomys* sp.; I) *Oligoryzomys flavescens*; J) *Trinomys* sp. Photos by Cleber C. S. Silva (A, B), Mariana F. C. Loguercio (C, E, I), Roberto L. M. Novaes (D, F), Oscar Rocha-Barbosa (G), and Ana C. Delciellos (H, J).

Bats: A total of 63 individuals of 10 species of bats belonging to the family Phyllostomidae were recorded (Figure 2 and Table 5). The exclusive sampling of individuals of this family is probably related to the method used, the mistnets. The species of other families, especially those with insectivorous diet, can detect and avoid mistnets, thus it would be necessary to use a greater sampling effort or alternative methods, such as active search for roosts, for example (Arita 1993; Pedro and Taddei 1997). Among these 10 species, three belong to the subfamily Phyllostominae (Table 5). The species of this subfamily are considered biological indicators of habitat quality (Fenton *et al.* 1992). This suggests that the study area is still represented by good-quality habitat, sustaining species with poorly known ecology, as *Chrotopterus auritus* and *Lonchorhina aurita* in the state of Rio de Janeiro. This is the first survey of the bats in the region of SBNP.

Implications for conservation: This study was conducted along the RJ-165 highway, in the section inside SBNP. Among the main impacts caused by roads are: habitat loss and fragmentation, affecting animal populations by reducing the size of populations and increasing the isolation between them; facilitation of human access to areas previously inaccessible, favouring hunting and introduction of invasive and domestic species; and the roadkill of wild animals, related to road traffic and high speed (Laurance *et al.* 2009). During this study, no road-killed animals were found. However, because this road is inserted into a national park characterized by high biodiversity and occurrence of endangered species, the installation of culverts and artificial walkways for arboreal species is highly recommended. Their effectiveness was widely studied in previous studies (e.g. Yanes *et al.* 1995; Laurance *et al.* 2009).

Hunting also represents a serious threat to biodiversity conservation, especially for mammals (Ojasti 1984; Fa *et al.* 2002; Travassos 2011). Although most studies on the effects of hunting on mammals in Brazil are done in the Amazon, this is a frequent problem in many biomes of Brazil, including the Atlantic Forest (Cullen *et al.* 2001; Travassos 2011). During the present study we observed illegal hunting traps scattered in the forest, among other evidences of hunters inside SBNP, as already detected in a previous study (B.F. Leopoldo, unpublished data). In areas where logging has been reduced for economic, legal or natural reasons, excessive hunting can become a major cause of species loss (Milner-Gulland *et al.* 2003; Cullen *et al.* 2004; Wright and Muller-Landau 2006). In Brazil, hunting is considered a crime according to the Federal Law 5,197 of 3 January 1967, but surveillance and law enforcement are poor, especially in large stretches of continuous forest such as Serra da Bocaina.

The region of the SBNP is considered one of the last large remnants of primary Atlantic Forest in the state of Rio de Janeiro. Protected areas are crucial for the preservation of good quality habitats, especially in this biome with a long history of habitat fragmentation (Ribeiro *et al.* 2009). Therefore, the SBNP plays a key role for the maintenance of viable populations, including populations of endangered species such as *Puma concolor* and *Blarinomys breviceps*, highlighting the need for new effective measures of management and conservation. Thus, complete mammal surveys in this region are of vital importance for the development of biodiversity conservation policies. In this sense, the present study is of fundamental importance, although still incipient. It is expected that future studies should record an increased number of species in the region of SBNP, especially for non-volant small mammals and bats.

Table 5. List of mammal species recorded along the RJ-165 highway in Serra da Bocaina National Park, state of Rio de Janeiro, Brazil. Type of record: B= burrow; C= carcass, CA= capture; CT= camera trap; V= vocalisation; VO= visual observation; T= track. Numbers represent a species abundance index obtained from live traps, pitfall traps, and mistnets.

SPECIES	TYPE OF RECORD
Order Chiroptera	
Family Phyllostomidae	
Subfamily Glossophaginae	
Anoura caudifer (É. Geoffroy, 1818)	CA (2)
Anoura geoffroyi Gray, 1838	CA (5)
Subfamily Phyllostominae	
Chrotopterus auritus (Peters, 1856)	CA (1)
Lonchorhina aurita Tomes, 1863	CA (2)
Tonatia bidens (Spix, 1823)	CA (1)
Subfamily Carolliinae	
Carollia perspicillata (Linnaeus, 1758)	CA (27)
Subfamily Stenodermatinae	
Artibeus fimbriatus Gray, 1838	CA (2)
Artibeus obscurus (Schinz, 1821)	CA (2)
Sturnira lilium (É. Geoffroy, 1810)	CA (19)
Sturnira tildae de la Torre, 1959	CA (2)
Order Carnivora	
Family Canidae	
Cerdocyon thous (Linnaeus, 1766)	VO
Family Felidae	
Leopardus pardalis (Linnaeus, 1758)	T
Leopardus tigrinus (Schreber, 1775)	T
Puma concolor (Linnaeus, 1771)	T, VO
Family Mustelidae	
Eira barbara (Linnaeus,1758)	VO
Family Procyonidae	
Nasua nasua (Linnaeus, 1766)	CT
Order Cingulata	
Family Dasypodidae	
Dasypus novemcinctus (Linnaeus, 1758)	CT, VO
Euphractus sexcinctus (Wagler, 1830)	B
Order Pilosa	
Family Myrmecophagidae	
Tamandua tetradactyla (Linnaeus, 1758)	CT
Order Didelphimorphia	
Family Didelphidae	
Chironectes minimus (Zimmermann, 1780)	VO
Didelphis aurita Wied-Neuwied, 1826	CA (11), CT, VO
Gracilinanus microtarsus (Wagner, 1842)	CA (1)
Marmosops sp. (Lund, 1840)	CA (5)
Metachirus nudicaudatus (É. Geoffroy, 1803)	CA (2)
Monodelphis americana (Muller, 1776)	CA (1)
Philander frenatus (Olfers, 1818)	CA (3), CT

Table 5. ***Continued.***

SPECIES	TYPE OF RECORD
Order Artiodactyla	
Family Cervidae	
Mazama sp.	T
Family Tayassuidae	
Tayassu pecari (Link, 1795)	C
Order Primates	
Family Callitrichidae	
Callithrix aurita (Humboldt, 1812)	VO
Callithrix jacchus (Linnaeus, 1758)	VO
Family Atelidae	
Alouatta guariba (Humboldt, 1812)	V
Order Rodentia	
Family Sciuridae	
Subfamily Sciurinae	
Guerlinguetus ingrami Grey, 1821	VO
Family Cricetidae	
Subfamily Sigmodontinae	
Akodon cursor Winge, 1887	CA (1)
"Akodon" serrensis Thomas, 1902	CA (3)
Blarinomys breviceps Thomas, 1979	CA (1)
Delomys dorsalis Hensel, 1873	CA (2)
Delomys sp.	CA (18)
Euryoryzomys russatus (Wagner, 1848)	CA (7)
Juliomys rimofrons Oliveira e Bonvicino, 2002	CA (1)
Oecomys catherinae Thomas, 1906	CA (1)
Oligoryzomys flavescens (Whaterhouse, 1837)	CA (3)
Rhipidomys itoan Costa, Geise, Pereira and Costa, 2011	CA (4)
Thaptomys nigrita (Lichtenstein, 1830)	CA (1)
Family Cuniculidae	
Cuniculus paca (Linnaeus, 1766)	CT
Family Dasyproctidae	
Dasyprocta leporina (Linnaeus, 1758)	T
Family Erethizontidae	
Sphiggurus villosus F. Cuvier, 1823	VO
Family Echimyidae	
Subfamily Eumysopinae	
Trinomys sp.	CA (2)
Family Caviidae	
Subfamily Caviinae	
Cavia fulgida Wagler, 1831	VO
Order Lagomorpha	
Family Leporidae	
Sylvilagus brasiliensis (Linnaeus, 1758)	VO

Acknowledgments: Thanks to Eduardo Peña Lopezoza for the assistance in the fieldwork. This study was part of the Program of Fauna Inventory preceding the beginning of paving works of the state highway RJ-165 to be held by Departamento de Estradas de Rodagem (DER-RJ) and Secretaria de Estado de Obras (SEOBRAS) of the state of Rio de Janeiro, and Universidade do Estado do Rio de Janeiro.

Literature Cited

Aguiar, L.M.S. and J. Marinho-Filho. 2004. Activity patterns of nine phyllostomid bat species in a fragment of the Atlantic Forest in southeastern Brazil. *Revista Brasileira de Zoologia* 21(2): 385-390.

Anthony, E.L.P. 1988. Age determination in bats; p. 47-58 *In* T.H. Kunz (ed.). *Ecological and behavioral methods for the study of bats.* Washington: Smithsonian Institution Press.

Arita, H.T. 1993. Rarity in neotropical bats: correlations with phylogeny, diet and body mass. *Ecological Applications* 3(3): 506-517.

Asfora, P.H., A.R.T. Palma, D. Astúa and L. Geise. 2011. Distribution of *Oecomys catherinae* Thomas, 1909 (Rodentia: Cricetidae) in northeastern Brazil with karyotypical and morphometrical notes. *Biota Neotropica* 11(2): 1-10.

Astua de Moraes, D., N. de la Sancha and L. Costa. 2011. *Didelphis aurita*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Attias, N., D.S.L. Raíces, F.S. Pessoa, H. Alburquerque, T. Jordão-Nogueira, T.C. Modesto and H.G. Bergallo. 2009. Potential distribution and new records of *Trinomys* species (Rodentia: Echimyidae) in the state of Rio de Janeiro. *Zoologia* 26(2): 305-315.

Auricchio, P. 1995. *Primatas do Brasil.* São Paulo: Terra Brasilis Editora Ltda. 168 p.

Barquez, R.M., M.A. Mares and J.K. Braun. 1999. The bats of Argentina. *Special Publications Museum of Texas Tech University* 42: 1-275.

Barros-Batlesti, D.M., R. Martins, C.R. Bertim, N.H. Yoshinari, V.L.N. Bonoldi, E.P. Leon, M. Miretzki and T.T.S. Sehumaker. 2000. Land fauna composition of small mammals of a fragment of Atlantic Forest in the State of São Paulo, Brazil. *Revista Brasileira de Zoologia* 17(1): 241-249.

Becker, M. and J.C. Dalponte. 1999. *Rastros de mamíferos silvestres brasileiros: um guia de campo.* 2ª ed. Brasília: Editora Universidade de Brasília. 180 p.

Bergallo, HG, C.F.D. Rocha, M.A.S. Alves and M.V. Sluys. 2000. *A fauna ameaçada de extinção do estado do Rio de Janeiro*. Rio de Janeiro: Editora da Universidade do Estado do Rio de Janeiro. 168p.

Berta, A. 1982. *Cerdocyon thous*. *Mammalian Species* 186:1-4.

Black, P. and A. Vogliotti. 2008. *Mazama gouazoubira*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Bonaccorso, F.J. and N. Smythe. 1972. Punch-marking bats: an alternative to banding. *Journal of Mammalogy* 53(2): 389-390.

Bonvicino, C. and L. Geise. 2008. *Juliomys rimofrons*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Bonvicino, C.R., J.A. Oliveira and P.S. D`Andrea. 2008. *Guia dos roedores do Brasil, com chaves para gêneros baseadas em caracteres externos.* Rio de Janeiro: Centro Pan-Americano de Febre Aftosa. 120 p.

Borges, P.A.L. and W.M. Tomás. 2004. *Guia de rastros e outros vestígios de mamíferos do Pantanal.* Corumbá: Embrapa Pantanal. 139 p.

Bredt, A. and W. Uieda. 1996. Bats from urban and rural environments of the Distrito Federal, mid-western Brazil. *Chiroptera Neotropical* 2(2): 54-57.

Brito, D. and D. Astua de Moraes. 2008. *Monodelphis americana*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Brito, D., D. Astua de Moraes, D. Lew and P. Soriano. 2008a. *Gracilinanus microtarsus*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Brito, D., D. Astua de Moraes, D. Lew, P. Soriano and L. Emmons. 2008b. *Marmosops incanus*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Brito, D., D. Astua de Moraes, D. Lew and P. Soriano. 2008c. *Marmosops paulensis*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Brito, D., D. Astua de Moraes, D. Lew and N. de la Sancha. 2011. *Metachirus nudicaudatus*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Brosset, A. and P. Charles-Dominique. 1990. The bats from French Guiana: a taxonomic, faunistic and ecological approach. *Mammalia* 54(4): 509-560.

Caso, A., C. Lopez-Gonzalez, E. Payan, E. Eizirik, T. de Oliveira, R. Leite-Pitman, M. Kelly and C. Valderrama. 2008. *Leopardus pardalis*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Cerqueira, R. and C.J. Tribe. 2007. Genus *Didelphis* Linnaeus, 1758; p. 17-25 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Cheida, C.C. and L.B. Santos. 2010. Ordem Carnivora; p. 463-492 *In* N.R. Reis, A.L. Peracchi, M.N. Fregonezi and B.K. Rossaneis (ed.). *Mamíferos do Brasil: Guia de Identificação.* Rio de Janeiro: Technical Books Editora.

Cheida, C.C., E. Nakano-Oliveira, R. Fusco-Costa, F. Rocha-Mendes and J. Quadros. 2011. Ordem Carnivora; p. 235-288 *In* N.R. Reis, A.L. Peracchi, W.A. Pedro and I.P. Lima (ed.). *Mamíferos do Brasil.* 2ªEd. Londrina: Editora da Universidade Estadual de Londrina.

Cherem, J.J., M. Kammers, I.R. Ghizoni-Jr. and A. Martins. 2007. Mamíferos de médio e grande porte atropelados em rodovias do Estado de Santa Catarina, sul do Brasil. *Biotemas* 20(2): 81-96.

Conner, M.C., R.F. Labisky and D.R. Progulske. 1983. Scent-station indices as measures of population abundance for bobcats, raccoons, gray foxes, and opossums. *Wildlife Society Bulletin* 11(2): 146-152.

Costa, B.M.A., L. Geise, L.G. Pereira and L.P. Costa 2011. Phylogeography of *Rhipidomys* (Rodentia: Cricetidae: Sigmodontinae) and description of two new species from southeastern Brazil. *Journal of Mammalogy* 92(5): 945–962.

Courtenay, O. and L. Maffei. 2008. *Cerdocyon thous*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Creighton, G.K. and A.L. Gardner. 2007. Genus *Gracilinanus* Gardner and Creighton, 1989; p. 43-50 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Cullen, L., E.R. Bodmer and C. Valladares-Pádua 2001 Ecological consequences of hunting in Atlantic forest patches, São Paulo, Brazil. *Oryx* 35(2): 137-144.

Cullen, L., E.R Bodamer, C. Valladares-Pádua and J.D. Ballou. 2004. Mammalian densities and species extinctions in Atlantic Forest fragments: the need for population management; p. 211-226 *In* K.M. Silvius, R.E. Bodamer and J.M.V. Fragoso, (ed.). *People in Nature: wildlife conservation in South and Central America.* New York: Columbia University Press.

Cullen, L. and R. Rudran. 2006. Transectos lineares na estimativa de densidade de mamíferos e aves de médio e grande porte; p. 169-179 *In* L. Cullen, R. Rudran and C. Valladare-Padua (eds.). *Métodos de estudos em biologia da conservação e manejo da vida silvestre*. Curitiba: Universidade Federal do Paraná / Fundação O Boticário de Proteção à Natureza.

Drummond, J.A. 1997. *Devastação e preservação ambiental: os Parques Nacionais do Estado do Rio de Janeiro.* Niterói: EDUFF. 306p.

Durate, J.M.B., A. Vogliotti and M. Barbanti. 2008. *Mazama americana*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Emmons, L.H. 1997. *Neotropical rainforest mammals: a field guide.* 2nded. Chicago: University of Chicago Press. 307 p.

Emmons, L. and K. Helgen. 2008. *Nasua nasua*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Emmons, L. and F. Reid. 2008. *Dasyprocta leporina*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Esbérard, C.E.L. 2003. Diversidade de morcegos em área de Mata Atlântica regenerada no sudeste do Brasil. *Revista Brasileira de Zoociências* 5(2): 189-204.

Esbérard, C.E.L. and H.G. Bergallo. 2004. Aspectos biológicos de *Tonatia bidens* (Spix) no estado do Rio de Janeiro, sudeste do Brasil (Mammalia, Chiroptera, Phyllostomidae). *Revista Brasileira de Zoologia* 21(2): 253-259.

Evelyn, M.J. and D.A. Stiles. 2003. Roosting requirements of two frugivorous bats (*Sturnira lilium* and *Artibeus intermedius*) in fragmented neotropical forest. *Biotropica* 35(3): 405-418.

Fa, J.E., C.A. Peres and J. Meeuwig. 2002. Bushmeat exploitation in tropical forests: an intercontinental comparison. *Conservation Biology* 16: 232-237.

Fenton, M.B., L. Acharya, D. Audet, M.B.C. Hickey, C. Merriman, M.K. Obrist, D.M. Syme and B. Adkins. 1992. Phyllostomid bats (Chiroptera, Phyllostomidae) as indicators of habitat disruption in the neotropics. *Biotropica* 24(3): 440-446.

Filho, H.O., I.P. Lima and F.N.O. Fogaça. 2007. Subfamília Carolliinae; p. 99-106 *In* N.R. Reis, A.L. Peracchi, W.A. Pedro and I.P. Lima (ed.). 2007. *Morcegos do Brasil.* Londrina.

Fiszon, J.T., N.P.X. Marchioro, R.M. Brietez, D.C. Cabral, N. Camely, V. Canavesi, P.R. Castella, E.B.V. Castro, L. Cullen, M.B.S. Cunha, E.O. Figueiredo, I.L. Franke, H. Gomes, L.J. Gomes, V.H.V. Hreisemnou, E.C. Landau, S.M. Lima, A.T.L. Lopes, E. Mariano-Neto, A.L. Mello, L.C. Oliveira, K.Y. Ono, N.W.V. Pereira, A.S. Rodrigues, A.A.F. Rodrigues, C.R. Ruiz, L.F. Santos, W.S. Smith and C.R. Souza. 2003. Causas antrópicas; p. 65-99 *In* D.M. Rambaldi and D.A.S. Oliveira (Org.). *Fragmentação de ecossistemas: causas, efeitos sobre a biodiversidade e recomendações de políticas públicas.* 2ed. Brasília: MMA/SBF.

Gardner, A.L. 2005a. Order Cingulata; p. 94-99 *In* D.E. Wilson and D.M. Reeder (ed.). *Mammal Species of the World.* Baltimore: Johns Hopkins University Press. 2.142p. Available at http://www.press.jhu.edu

Gardner, A.L. 2005b. Order Pilosa; p. 100-103 *In* D.E. Wilson and D.M. Reeder (ed.). *Mammal Species of the World.* Baltimore: Johns Hopkins University Press. 2.142p. Available at http://www.press.jhu.edu

Gardner, A.L. 2005c. Order Didelphimorphia; p. 3-18 *In* D.E. Wilson and D.M. Reeder (ed.). *Mammal Species of the World.* Baltimore: Johns Hopkins University Press. 2.142p. Available at http://www.press.jhu.edu

Gardner, A.L. 2007a. *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press. 669p.

Gardner, A.L. 2007b. Tribe Sturnirini; p. 363-375 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Gardner, A.L. and G.K. Creighton. 2007. Genus *Marmosops* Matschie, 1916; p. 61-74 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Gardner, A.L. and M. Dagosto. 2007. Tribe Metachirini Reig, Kirsch, and Marshall, 1985; p. 35-39 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Geise, L. and D. Astúa. 2009. Distribution extension and sympatric occurrence of *Gracilinanus agilis* and *G. microtarsus* (Didelphimorphia, Didelphidae), with cytogenetic notes. *Biota Neotropica* 9(4): 269-276.

Geise, L. 2012. *Akodon cursor* (Rodentia: Cricetidae). *Mammalian Species* 44(893): 33-43.

Geise, L, H.G. Bergallo, C.E.L. Esbérard, C.F.D. Rocha and M.V. Sluys. 2008. The karyotype of *Blarinomys breviceps* (Mammalia: Rodentia: Cricetidae) with comments on its morphology and some ecological notes. *Zootaxa* 1907: 47-60.

Gregorin, R., S.A.M. Simões, I.J. Lima and J.S.S. Júnior. 2010. Ordem Primates; p. 101-212 *In* N.R. Reis, A.L. Peracchi, M.N. Fregonezi and B.K. Rossaneis (ed.). *Mamíferos do Brasil: Guia de Identificação.* Rio de Janeiro: Technical Books Editora.

Griffiths, T.A. and A.L. Gardner. 2007. Subfamily Glossophaginae Bonaparte, 1845; p. 224-243 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Handley, C.O. 1976. Mammals of the Smithsonian Venezuelan Project. *Brigham Young University, Science Bulletin, Biological Series* 20(5): 1-91.

Handley, C.O. and J. Ochoa. 1997. New species of mammals from northern South America: a sword-nosed bat, genus *Lonchorhina* Tomes (Chiroptera, Phyllostomidae). Memoria *de la Sociedad de Ciencias Naturales La Salle* 57: 71-82.

Heilbrun, R.D., N.J. Silvy, M.J. Peterson and M.E. Tewes. 2006 Estimating Bobcat abundance using automatically triggered cameras. *Wildlife Society Bulletin* 34(1): 69-73.

Hengemuhle, A. and C.V. Cademartori. 2008. Levantamento de mortes de vertebrados silvestres devido a atropelamento em um trecho da Estrada do Mar (RS-389). *Biodiversidade Pampeana* 6(2): 4-10.

IBAMA – Instituto Brasileiro do Meio Ambiente e dos Recursos Renováveis. 2001. *Plano de Manejo do Parque Nacional da Serra da Bocaina*. Available at http://www.paraty.com.br/bocaina/index.htm. IBAMA/PRÓ- BOCAINA. 6v.

IUCN - International Union for Conservation of Nature. 2011. *Red List of Threatened Species. Version 2011.1* Electronic Database accessible at http://www.iucnredlist.org. Captured on 01 July 2011.

Kelly, M.J., A.J. Noss, M.S.D. Bitetti, L. Maffei, R.L. Arispe, A. Paviolo, C.D. Angelo and Y.E.D. Blanco. 2008. Estimating puma densities from camera trapping across three study sites: Bolivia, Argentina, and Belize. *Journal of Mammalogy* 89(2): 408–418.

Kunz, T.H. and A. Kurta. 1988. Capture methods and holding devices; p.1-29 *In* T.H. Kunz (ed.). *Ecological and behavioral methods for the study of bats.* Washington: Smithsonian Institution Press.

Laurance, W.F., M. Goosem and S.G.W. Laurance. 2009. Impacts of roads and linear clearings on tropical forests. *Trends in Ecology and Environment* 1149: 1-11.

Lima, I.P. and N.R. Reis. 2004. The availability of Piperaceae and the search for this resource by *Carollia perspicillata* (Linnaeus) (Chiroptera, Phyllostomidae, Carollinae) in Parque Municipal Arthur Thomas, Londrina, Paraná, Brazil. *Revista Brasileira de Zoologia* 21(2): 371-377.

Lino, C.F. and J.L. Alburquerque. 2007. *Mosaicos de Unidades de Conservação no Corredor da Serra do Mar.* São Paulo: Conselho Nacional da Reserva da Biosfera da Mata Atlântica.

Lira, P.K., F.A.S. Fernandez, H.S.A. Carlos and P.L. Curzio. 2007. Use of a fragmented landscape by three species of opossum in south-eastern Brazil. *Journal of Tropical Ecology* 23: 427-435.

Lucherini, M., J.I. Reppucci, R.S. Walker, M.L. Villalba, A. Urstten, G. Gallardo, A. Iriarte, R. Villalobos and P. Perovic. 2009. Activity pattern segregation of carnivores in the high Andes. *Journal of Mammalogy* 90(6): 1404–1409.

Macedo, J., D. Loretto, M.V. Vieira and R. Cerqueira. 2006. Classes de desenvolvimento em marsupiais: um método para animais vivos. *Mastozoología Neotropical* 13: 133-136.

Machado, A.B.M., G.M. Drummond and A.P. Paglia (Eds.). 2008. *Livro vermelho da fauna brasileira ameaçada de extinção.* 1ª Ed. Brasília: Ministério do Meio Ambiente. 1420p.

Maffei, L., A.J. Noss, E. Cuellar and D.I. Rumiz 2005. Ocelot (*Felis pardalis*) population densities, activity, and ranging behaviour in the dry forests of eastern Bolivia: data from camera trapping. *Journal of Tropical Ecology* 21: 1–6.

Marinho-Filho, J.S. and I. Sazima. 1998. Brazilian bats and conservation biology: a first survey; p. 282-294 *In* T.H. Kunz and P.A. Racey (ed.). *Bat biology and conservation.* Washington: Smithsonian Institution Press.

Marques-Aguiar, S.A. 2007. Genus *Artibeus* Leach, 1821; p. 301-320 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

McLellan, L.J. and K.F. Koopman. 2007. Subfamily Carolliinae Miller, 1924; p. 208-217 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Medri, I.M. and M. Superina. 2010. *Euphractus sexcinctus*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Medri, I.M., M.B. Sampaio, W.M. Tomas and P.A.L. Borges. 2010a. Ordem Cingulata; p. 79-90 *In* N.R. Reis, A.L. Peracchi, M.N. Fregonezi and B.K. Rossaneis (eds.). *Mamíferos do Brasil: Guia de Identificação.* Rio de Janeiro: Technical Books Editora.

Medri, I.M., M.B. Sampaio, W.M. Tomas and P.A.L. Borges. 2010b. Ordem Pilosa; p. 91-100 *In* N.R. Reis, A.L. Peracchi, M.N. Fregonezi and B.K. Rossaneis (eds.). *Mamíferos do Brasil: Guia de Identificação.* Rio de Janeiro: Technical Books Editora.

Mendes, S.L., A.B. Rylands, M.C.M. Kierulff and M.M. de Oliveira. 2008. *Alouatta guariba*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Milner-Gulland, E.J., E.L. Bennett and the SCB 2002 Annual Meeting Wild Meat Group. 2003. Wild meat: the bigger picture. *Trends in Ecology and Evolution* 18: 351-357.

Miranda, F. and D.A.Jr. Meritt. 2011. *Tamandua tetradactyla*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Moraes, L.B., D.E.P. Bossi and A.X. Linhares. 2003. Siphonaptera Parasites of wild rodents and marsupials trapped in three mountain ranges of the Atlantic Forest in southeastern Brazil. *Memórias do Instituto Oswaldo Cruz* 98(8): 1071-1076.

Mosaico Bocaina. 2010. Parque Nacional da Serra da Bocaina. Electronic Database accessible at http://www.bocaina.org.br/mosaico-bocaina/o-mosaico-bocaina. Captured on 19 May 2011.

Moura, M.C., A. Caparelli, S.R. Freitas and M.V. Vieira. 2005. Scale-dependent habitat selection in three didelphid marsupials using the spool-and-line technique in the Atlantic forest of Brazil. *Journal of Tropical Ecology* 21: 337-342.

Myers, N, R.A. Mittermeier, C.G. Mittermeier, G.A.B. Fonseca and J. Kent. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853-858.

Nogueira, M.R., D. Dias and A.L. Peracchi. 2007a. Subfamília Glossophaginae; p. 45-60 *In* N.R. Reis, A.L. Peracchi, W.A. Pedro and I.P. Lima (ed.). 2007. *Morcegos do Brasil.* Londrina.

Nogueira, M.R., A.L. Peracchi and R. Moratelli. 2007b. Subfamília Phyllostominae; p. 61-98 *In* N.R. Reis, A.L. Peracchi, W.A. Pedro and I.P. Lima (eds.). 2007. *Morcegos do Brasil.* Londrina.

Norris, D., F. Rocha-Mendes, R. Marques, R.A. Nobre and M. Galetti. 2011. Density and spatial distribution of buffy-tufted-ear marmosets (*Callithrix aurita*) in a continuous Atlantic Forest. *International Journal of Primatology* 32: 811-829.

Ojasti, J. 1984. Hunting and conservation of mammals in Latin America. *Acta Zoologica Fennica* 172: 177-181.

Oliveira, J.A. and C.R. Bonvicino. 2002. A new species of sigmodontine rodent from the Atlantic forest of eastern Brazil. *Acta Theriologica* 47: 307-322.

Oliveira, J.A. and C.R. Bonvicino. 2011. Ordem Rodentia; p. 358-415 *In* N.R. Reis, A.L. Peracchi, W.A. Pedro and I.P. Lima (ed.). *Mamíferos do Brasil.* 2ªEd. Londrina: Editora da Universidade Estadual de Londrina.

Oliveira, T.G. and K. Cassaro. 2005. *Guia de campo dos felinos do Brasil.* São Paulo: Instituto Pró-Carnívoros. 80p.

Oliveira, T., E. Eizirik, J. Schipper, C. Valderrama, R. Leite-Pitman and E. Payan. 2008. *Leopardus tigrinus*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Pacheco, S.M., M. Sodré, A.R. Gama, A. Bredt, E.M. Cavallini-Sanches, R.V. Marques, M.M. Guimarães and G.V. Bianconi. 2010. Morcegos urbanos: status do conhecimento e plano de ação para a conservação no Brasil. *Chiroptera Neotropical* 16(1): 630-647.

Pardinas, U., G. D'Elia, B. Patterson and P. Teta. 2008. *Akodon serrensis*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Patton, J., F. Catzeflis, M. Weksler, A. Percequillo, G. D'Elia and U. Pardinas. 2008. *Thaptomys nigrita*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Patton, J.L. and M.N.F. Silva. 2007. Genus *Philander* Brisson, 1762; p. 27-35 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Pavan, S.E. and Y.L.R. Leite. 2011. Morphological diagnosis and geographic distribution of Atlantic Forest red-rumped mice of the genus *Juliomys* (Rodentia: Sigmodontinae). *Zoologia* 28(5): 663-672.

Pedro, W.A. and V.A. Taddei. 1997. Taxonomic assemblage of bats from Panga Reserve, southeastern Brazil: abundance patterns and trophic relations in the Phyllostomidae. *Boletim do Museu de Biologia Mello Leitão* 6: 2-21.

Pereira, J., P. Teta, N. Fracassi, A. Johnson and P. Moreyra. 2005. Sigmodontinos (Rodentia, Cricetidae) de la Reserva de Vida Silvestre Urugua-í (Provincia de Misiones, Argentina), con la confirmación de la presencia de "*Akodon*" *serrensis* en la Argentina. *Mastozoología Neotropical* 12(1): 83-89.

Pine, R.H. and C.O.I Handley. 2007. Genus *Monodelphis* Burnett, 1830; p. 82-107 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Pires, A.S., P.K. Lira, F.A.S. Fernandez, G.M. Schittini and L.C. Oliveira. 2002. Frequency of movements of small mammals among Atlantic Coastal Forest fragments in Brazil. *Biological Conservation* 108(2): 229-237.

Reis, N.R., A.L. Peracchi, M.N. Fregonezi and B.K. Rossaneis. 2010. *Mamíferos do Brasil: Guia de Identificação.* Rio de Janeiro: Technical Books Editora.

Reis, N.R., A.L. Peracchi, W.A. Pedro and I.P. Lima. 2007. *Morcegos do Brasil.* Londrina: Editora da Universidade Estadual de Londrina. 253 p.

Reis, N.R., A.L. Peracchi, W.A. Pedro and I.P. Lima. 2011. *Mamíferos do Brasil.* 2ªEd. Londrina: Editora da Universidade Estadual de Londrina. 439 p.

Ribeiro, M.C., J.P. Metzger, A.C. Martensen, F.J. Ponzoni and M.N. Hirota. 2009. The Brazilian Atlantic Forest: how much is left, and how is the remaining forest distributed? Implications for conservation. *Biological Conservation* 142: 1141-1153.

Rossi, R.V., G.V. Bianconi, A.P. Carmignotto and C.L. Miranda. 2010. Ordem Didelphimorphia; p.19-74 *In* N.R. Reis, A.L. Peracchi, M.N. Fregonezi and B.K. Rossaneis (ed.). *Mamíferos do Brasil: Guia de Identificação.* Rio de Janeiro: Technical Books Editora.

Rossi, R.V. and G.V. Bianconi. 2011. Ordem Didelphimorphia; p. 31-70 *In* N.R. Reis, A.L. Peracchi, W.A. Pedro and I.P. Lima (ed.). *Mamíferos do Brasil.* 2ªEd. Londrina: Editora da Universidade Estadual de Londrina.

Rylands, A.B., M.C.M. Kierulff, S.L. Mendes and M.M. de Oliveira. 2008a. *Callithrix aurita*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Rylands, A.B, R.A. Mittermeier, M.M. de Oliveira and M.C.M. Kierulff. 2008b. *Callithrix jacchus*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Sekiema, M.L., N.R. Reis, A.L. Peracchi and V.J. Rocha. 2001. Morcegos do Parque Nacional do Iguaçu, Paraná (Chiroptera, Mammalia). *Revista Brasileira de Zoologia* 18(3): 749-754.

Silva, M.A.M.L., A. Ronconi, N. Cordeiro, D.E.P. Bossi, H.G. Bergallo, M.C.C. Costa, J.C.C. Balieiro and F.L. Varzim. 2007. Blood parasites, total plasma protein and packed cell volume of small wild mammals trapped in three mountain ranges of the Atlantic Forest in Southeastern Brazil. *Brazilian Journal of Biology* 67(3): 531-535.

Simmons, N.B. 2005. Order Chiroptera; p. 312-529 *In* D.E. Wilson and D.M. Reeder (eds.). *Mammal Species of the World.* Baltimore: Johns Hopkins University Press. 2.142p. Available at http://www.press.jhu.edu

Simmons, N.B. and R.S. Voss. 1998. The mammals of Paracou, French Guiana: a neotropical lowland rainforest fauna Part 1. Bats. *Bulletin of the American Museum of Natural History* 237: 1-220.

SMASP - Secretaria de Meio Ambiente do Estado de São Paulo. 2008. *Lista de espécies da fauna ameaçadas de extinção do Estado de São Paulo*. Electronic Database accessible at http://www.ambiente.sp.gov.br/listas_fauna.zip. Captured on 09 June 2009.

Soisalo, M.K. and S.M.C. Cavalcanti. 2006. Estimating the density of a jaguar population in the Brazilian Pantanal using camera-traps and capture–recapture sampling in combination with GPS radio-telemetry. *Biological Conservation* 129: 487-496.

Stein, B.R. and J.L. Patton. 2007. Subfamily Didelphinae Gray, 1821; Tribe Didelphini Gray, 1821; p. 14-17 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Straube, F.C. and G.V. Bianconi. 2002. Sobre a grandeza e a unidade utilizada para estimar esforço de captura com utilização de redes-de-neblina. *Chiroptera Neotropical* 8(2): 150-152.

Tejera-N., V.H., J. Araúz-G., V. León, A.R. Rodríguez, P. González, S. Bermúdez and R. Moreno. 1999. Primer registro del Zorro cangrejero *Cerdocyon thous* (Carnivora: Canidae) para Panamá. *Scientia* 14: 103-107.

Teta, P., E. Muschetto, S. Maidana, C. Bellomo and P. Padula. 2007. *Gracilinanus microtarsus* (Didelphimorphia, Didelphidae) en la Provincia de Misiones, Argentina. *Mastozoologia Neotropical* 14(1): 113-115.

Thies, W. and E.K.V. Kalko. 2004. Phenology of the neotropical pepper plants (Piperaceae) and their association with their main dispersers, two short-tailed fruit bats, *Carollia perspicillata* and *C. castanea* (Phyllostomidae). *Oikos* 104: 362-376.

Tomas, W.M., L.M. Tiepolo and J.M.B. Duarte. 2010. Ordem artiodactyla; p. 495-506 *In* N.R. Reis, A.L. Peracchi, M.N. Fregonezi and B.K. Rossaneis (eds.). *Mamíferos do Brasil: Guia de Identificação.* Rio de Janeiro: Technical Books Editora.

Travassos, L. 2011. Impacto da sobrecaça em populações de mamíferos e suas interações ecológicas nas florestas neotropicais. *Oecologia Australis* 15(2): 380-411.

Turci, L.C.B. and P.S. Bernarde. 2009. Vertebrados atropelados na Rodovia Estadual 383 em Rondônia, Brasil. *Biotemas* 22(1): 121-127.

Voss, R.S. and L.H. Emmons. 1996. Mammalian diversity in neotropical lowland rainforests: a preliminary assessment. *Bulletin of the American Museum of Natural History* 230: 1-115.

Umetsu, F., L. Naxara and R. Pardini. 2006. Evaluating the efficiency of pitfall traps in the Neotropics. *Journal of Mammalogy* 87(4): 757-765.

Weksler, M., C. Bonvicino, G. D'Elia, U. Pardinas, P. Teta and J.P. Jayat. 2008. *Oligoryzomys flavescens*. *In* IUCN 2011. *IUCN Red List of Threatened Species. Version 2011.2.* Electronic Database accessible at http://www.iucnredlist.org/. Captured on 14 June 2012.

Wetzel, R.M., A.L. Gardner, K.H. Redford and J.F. Eisenberg. 2007. Order Cingulata Illiger, 1811; p. 128-157 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Williams, S.L. and H.H. Genoways. 2007. Subfamily Phyllostominae Gray, 1825; p. 255-299 *In* A.L. Gardner (ed.). *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews, and Bats.* Chicago: The University of Chicago Press.

Williams, S.L., M.R. Willig and F.A. Reid. 1995. Review of the *Tonatia bidens* complex (Mammalia, Chiroptera), with descriptions of two new subspecies. *Journal of Mammalogy* 76(2): 612-626.

Wilson, D.E. and D.M. Reeder. 2005. *Mammal Species of the World.* Baltimore: Johns Hopkins University Press. 2.142p.

Woods, C.A. and C.W. Kilpatrick. 2005. Infraorder Hystricognathi; p. 1538-1600 *In* D.E. Wilson and D.M. Reeder (ed.). *Mammal Species of the World.* Baltimore: Johns Hopkins University Press. 2.142p. Available at http://www.press.jhu.edu

Wright, S.J. and A. Muller-Landau. 2006. The future of tropical forest species. *Biotropica* 38: 1-15.

Yanes, M., J.M. Velasco and F. Suarez. 1995. Permeability of roads and railways to vertebrates: The importance of culverts. *Biological Conservation* 71(3): 217-222.

Zanon, C.M. and N.R. Reis. 2010. Ordem Lagomorpha; p. 289-291 *In* N.R. Reis, A.L. Peracchi, M.N. Fregonezi and B.K. Rossaneis (eds.). *Mamíferos do Brasil: Guia de Identificação.* Rio de Janeiro: Technical Books Editora.

Zortéa, M. 2007. Subfamília Stenodermatinae; p. 107-128 *In* N.R. Reis, A.L. Peracchi, W.A. Pedro and I.P. Lima (ed.). 2007. *Morcegos do Brasil.* Londrina: Editora da Universidade Estadual de Londrina.

RECEIVED: May 2012
ACCEPTED: July 2012
PUBLISHED ONLINE: August 2012
EDITORIAL RESPONSIBILITY: Fabio Oliveira do Nascimento